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TM(L)-715 045/00

Utility Program Descriptions

Milestone 11

1604 to Bird Buffer Communication (SBRDTLK)

19 March 1963

TECHNICAL MEMORANDUM

(TM Series)

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Utility Program Descriptions	SYSTEM
Milestone 11	DEVELOPMENT
1604 to Bird Buffer Communication (SBRDTLK)	CORPORATION
By	2500 COLORADO AVE.
S. A. Gardner	SANTA MONICA
19 March 1963	CALIFORNIA
Approved	
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IDENTIFICATION

- A. Title: 1604 to Bird Buffer Communication (SBRDTLK)-Ident K34 Mod AF
- B. Programmed: S. A. Gardner, System Development Corporation,
18 January 1963
- C. Documented: S. A. Gardner, System Development Corporation,
11 March 1963

PURPOSE

To provide the communication link between the 1604 and Bird Buffer (160A) computers via a tape control unit operating in the satellite mode.

USAGE

A. Operating Procedures

The only way to initiate the "TRANSMIT" mode (i.e., communication between Bird Buffer and 1604) is by means of a 160A to 1604 interrupt signal; when MTCII services the interrupt, SBRDTLK will be called in and operated. As soon as program control is given to SBRDTLK, it will initiate a core-to-core transfer of a control message from the 160A to determine what particular data transfers are to be made. All operations are requested by control messages (Appendix A); no function cards are required. When SBRDTLK has completed the desired operation, it will return control to MTCII.

In order to expedite a real-time "hookup", a special function (*SHOOKUP) will be provided. By operating this function just before a scheduled real-time hookup, SBRDTLK will be loaded into memory and interrupt lockout will be turned off so the Bird Buffer may contact the 1604.

B. Parameters

All necessary parameters (type of data, direction of transfer, vehicle number, etc.) are embedded within the control messages which are

exchanged between the two computers.

C. Tape Assignments

1. 1604 to Bird Buffer Transfer Tape - channels 5 and 6, cabinet 2, units 1 and 2 (logically numbered 16 and 17). These tapes are duplicates; the prepass tape and the backup prepass tape.
2. SCHOPS Tape - channels 5 and 6, cabinet 2, unit 3 (logically numbered 18).
3. Bird Buffer to 1604 Transfer Tape - channels 5 and 6, cabinet 2, unit 4 (logically numbered 19). This is the input tape for tracking and vehicle time data.
4. At times, a blank may be needed; it will share the drive used by the SCHOPS tape (18).

D. On-line Messages (Console Typewriter)*

1. TRANSMIT MODE IS BEGINNING
Typed by MTCII just before giving program control to SBRDTLK.
2. LOAD VEHICLE XXXX ON UNITS 16, 17, CONTINUE
Typed by SBRDTLK (followed by a halt) due to:
 - a. SIBBTC (the Bird Buffer to 1604 communication routine) has requested data for a vehicle which is not on the transfer tapes currently mounted. This will require a restart from the Bird Buffer side.

*Under certain circumstances, MTCII may print on the on-line printer that an I/O unit is not ready.

- b. SBRDTLK is ready to update the prepass tapes, but the wrong ones are mounted. Load and continue.
- 3. READY TAPE UNIT XX, CONTINUE
Typed by SBRDTLK (followed by a halt); ready the specified tape and continue.
- 4. LOAD SCHOPS ON UNIT 18, CONTINUE
Typed by SBRDTLK (followed by a halt) because SIBBTC has requested SCHOPS data and the tape currently on unit 18 is not the SCHOPS tape. This will require a restart from the Bird Buffer side.
- 5. BLANK ON UNIT XX, CONTINUE
Typed by SBRDTLK (followed by a halt) due to:
 - a. the Bird Buffer to 1604 Transfer Tape (19) is full, which will require a restart from the Bird Buffer side if a delay in excess of 40 seconds occurs.
 - b. a scratch tape (18) is needed for updating the prepass tapes. Load and continue.
- 6. READY TO COPY UPDATE - LOAD BLANK ON UNIT 16, SWITCH 17/18 AND CONTINUE
Typed by SBRDTLK (followed by a halt) when ready to write a new prepass tape. Tape 18 will become the new backup tape on unit 17; the old backup tape on 17 should be switched to unit 18 (it may be needed again in the event that message 7, below, occurs next).
- 7. PARITY ON UNIT 17 - RELOAD PREPASS ON UNIT 16, SWITCH 17/18. RAISE JUMP KEY 1 TO TRY UPDATE AGAIN.

Typed by SBRDTLK (followed by a halt) when parity persists while reading the new backup tape. The old prepass tape should be reloaded on unit 16, the old backup tape should be switched from 18 to 17, and a new blank on 18 might be desirable. If jump key 1 is set upon continuing, SBRDTLK will start the update processing over again. Otherwise, it will housekeep and return control to MTCII.

8. BIRD BUFFER CONTACT LOST - JOB ABORTED

Typed by SBRDTLK due to persistent parity errors in core-to-core transfers, or an excessive delay (30 seconds) on the Bird Buffer side. Control returns to MTCII.

9. REQUESTED DATA NOT AVAILABLE - JOB ABORTED

Typed by SBRDTLK when SIBBTC has requested data for a rev, station, or data type which is not present on the transfer tapes. Control returns to MTCII.

10. LAST DATA FROM BB FOR WRONG 1604 - JOB ABORTED

Typed by SBRDTLK after receiving data from a different Bird Buffer than the one it started communicating with; control returns to MTCII.

11. PARITY ON UNIT XX

Typed by SBRDTLK due to parity or checksum errors when attempting to read or write a tape. The record in error is skipped; parity on unit 16 will result in an attempt to read the corresponding record from unit 17.

12. PART OF REQUESTED DATA COULD NOT BE SENT DUE TO PARITY

Typed by SBRDTLK when one or more records from the transfer tapes (or SCHOPS tape) could not be read successfully, resulting in the

bad data being skipped and not transmitted to the Bird Buffer. Although this should occur very rarely, if ever, the tapes involved should be regenerated and the Bird Buffer function which required the data should be rerun to obtain all requested data.

13. PARITY ON BOTH PREPASS TAPES DURING UPDATE - RECORD DELETED

Typed by SBRDTLK when the same record (or records) could not be read successfully from either the prepass or backup tapes (units 16 and 17); the bad record was skipped. As with message 12, this should occur very rarely, if ever; no recovery possible except for complete regeneration of the prepass tapes.

14. UPDATE SUCCESSFUL - DISCARD OLD PREPASS TAPES

Typed by SBRDTLK after successfully updating the prepass tapes. The tapes currently mounted on units 16 and 17 are the new prepass tapes. The old backup tape on unit 18 may be used as a scratch tape, if desired.

15. TRANSMIT MODE IS TERMINATED

Typed by MTCII immediately after the operation of SBRDTLK.

E. Error Returns and Halts

Any errors discovered by SBRDTLK will result in one of the printouts described above. If the program halts, one of messages 2 through 7 should have been typed to notify the operator of corrective action; if no message was typed, the only recovery possible is to clear interrupt lockout and reinitiate the function from the Bird Buffer.

F. Data Formats

Control messages, data messages, and transfer tape formats may be found in Appendices A, B, and C, respectively.

METHOD

A. Interrupting the 1604

When the Bird Buffer reads a control card which will necessitate the acquisition of new prepass data, command messages, or SCHOPS information from the 1604, or the transmittal of tracking and vehicle time data to the 1604, the Bird Buffer to 1604 communication routine (SIBBTC) will be operated. If SIBBTC is able to interrupt the 1604 (MTCII sets a hardware flag, Flag 1, whenever the 1604 is not to be interrupted; the flag is cleared between functions*), it will do so, causing MTCII to execute its interrupt servicing routine. MTCII will acknowledge the interrupt and call in and operate SBRDTLK. To avoid delays (searching the master tape for SBRDTLK, etc.) in a real-time situation, the function "*SHOOKUP", operated just prior to a scheduled real-time contact, will load SBRDTLK into core and ready the 1604 for a Bird Buffer interrupt.

B. Direct (core-to-core) Transfers

Two flip-flops in the tape cabinet, Flag 1 and Flag 2, are used as follows. SBRDTLK gives read or write control to the 160A for every direct transfer and then initiates an input or output. As soon as SIBBTC senses read or write control, it executes the corresponding output or input. When the transfer is complete, SIBBTC notifies SBRDTLK by setting Flag 2, which SBRDTLK then clears. The data-receiving computer then sets Flag 1 to signify that the data was received error-free. If Flag 1 is not set within 500 milliseconds (the data did not sumcheck properly), the data-sending computer will start the direct transfer again. See restriction A.

* In addition to setting the "don't interrupt me" flag, MTCII will lock out interrupts when: a) making I/O transfers; b) in interrupt routine (including SBRDTLK).

C. Operations Performed while in Bird Buffer Contact

1. Communicates with the Bird Buffer by means of control messages (Appendix A).
2. In response to control message A, receives pass data (tracking and vehicle time data) for vehicle V, revolutions R_i , and records the data on the Bird Buffer to 1604 Transfer Tape (19).
3. In response to control message B, transmits prepass data from the 1604 to Bird Buffer Transfer Tape (16, 17) for the requested vehicle, revolution (all if not specified), and station (all if not specified).
4. In response to control message D, transmits real-time commands from the 1604 to Bird Buffer Transfer Tape for the requested vehicle, revolution (all if not specified), and station (all if not specified).
5. In response to control message C, transmits scheduling data from the SCHOPS tape (18) for the requested station (all if not specified).
6. Verifies data by checksums, from tape and from the Bird Buffer, with the additional requirement that all command data sent to the Bird Buffer be sent back to the 1604 for bit-by-bit verification with the original data.
7. Notifies the Bird Buffer and 1604 operator of error conditions.

D. Operations performed after Bird Buffer Contact ("Update" mode)

1. In response to control message E, which signifies termination of the "Transmit" mode, SBRDTLK deletes all prepass data from the

1604 to Bird Buffer Transfer Tapes (16, 17) for vehicle V, revolutions R_j ($0 \leq R_j \leq R_i$). See C.2, above.

2. Verifies data by checksums from tape and notifies the 1604 operator of error conditions.

RESTRICTIONS

- A. If the completion of any core-to-core transfer exceeds thirty seconds, or if any data fails to sumcheck properly after five successive transfers of the same data, both SIBBTC and SBRDTLK will abort, with appropriate printouts (message 8).
- B. SBRDTLK assumes that the input, or tracking tape (19), is positioned in one of two places:
 1. After the double end-of-file if the tape is not a new one.
 2. After the single end-of-file if the tape is a new one.

SBRDTLK will leave the tracking tape positioned after the double end-of-file.

No assumptions are made about the other tapes (16-18); SBRDTLK will rewind and examine them to ensure the proper tapes are loaded for any particular operation. It will leave all but the tracking tape rewound.

- C. All blank tapes for use by SBRDTLK must have been initialized by SIRT to start with an end-of-file.
- D. Two MTCII subroutines, INFLEX and TAPEIO, are used by SBRDTLK.
- E. Prior to operating SBRDTLK, the transfer tapes must have been written

on at least once by SWRTOUT and SMERGE.

F. Maximum record size "readable" by SBRDTLK is 512 words including the record checksum.

G. Once a tape has been determined "ready" by SBRDTLK, that tape is expected to remain ready unless dismounted.

TIMING

Since SBRDTLK does no data reduction and a minimum of data formatting, its timing is essentially a function of data storage and retrieval to and from tapes; i.e., the time required for tape manipulation. There are, however, two time factors which should be mentioned again. As discussed in Method, above, there exists a 500 millisecond (maximum) delay while waiting for SIBBTC to sumcheck the last message received by the 160A; and, as mentioned in restriction A, above, there also exists a thirty second (maximum) delay while waiting for the last direct transfer initiated to go to completion.

STORAGE REQUIREMENTS

Program: 450 words
Storage: 1190 words
Total: 1640 words

VALIDATION

Validation test inputs are described in Appendix D.

REFERENCES

- A. TM-(L)-834/000/01, Bird Buffer Combined Milestone 3 and 4,
17 December 1962.

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- B. TM-891/001/00, Combined Milestone 3-4 for the 1604 Augmentation Communication Programs, 20 December 1962.
- C. *N-(L)-19081/017/00 and N-(L)-19081/017/00A, Milestone 7 Operating Instructions for SBRDTLK, 1604 to Bird Buffer Communication Routine, 21 January 1963.
- D. *N-(L)-19081/013/01, Milestone 7 Operating Instructions for SIBBTC, Bird Buffer to Computer Communications, 28 January 1963.
- E. STAN (test program for validation) - AFCPL reference number 00813.
- F. SBRDTLK - AFCPL reference number is 75934.

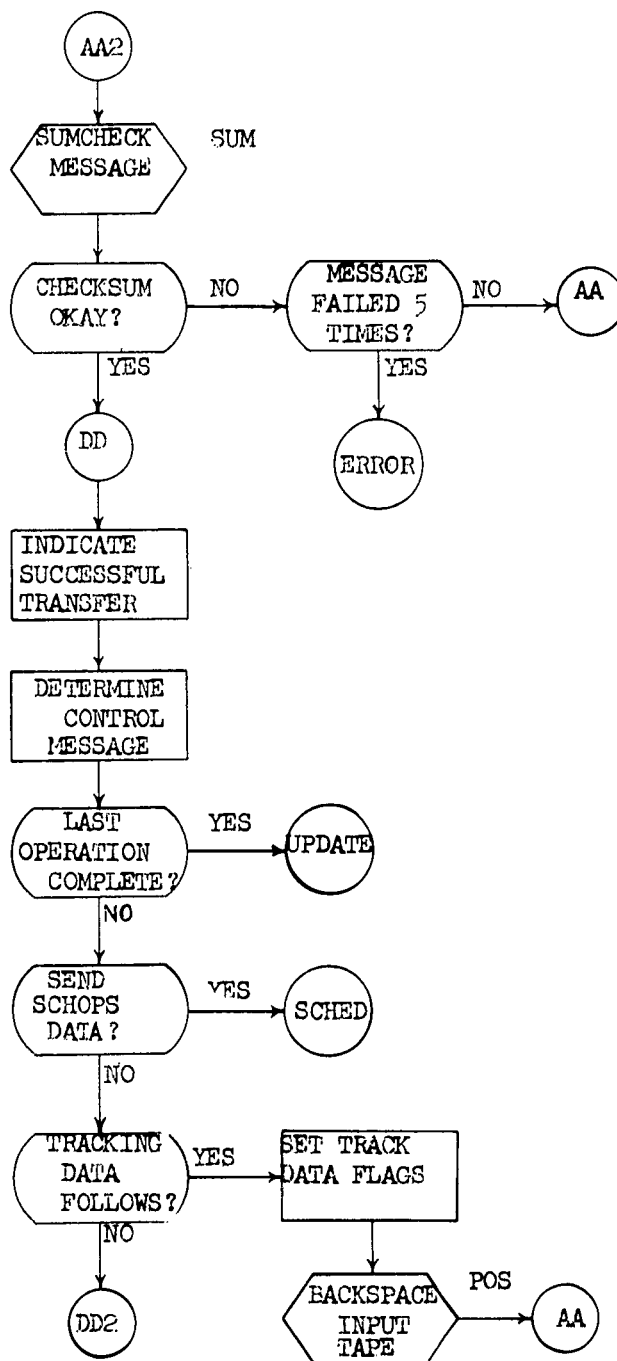
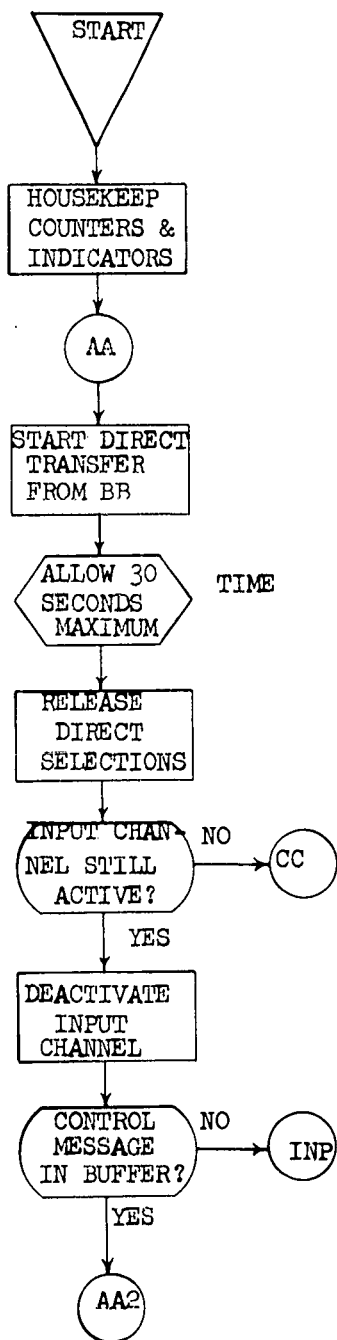
*N (Notes) are internal SDC documents and are ordinarily not released to outside companies.

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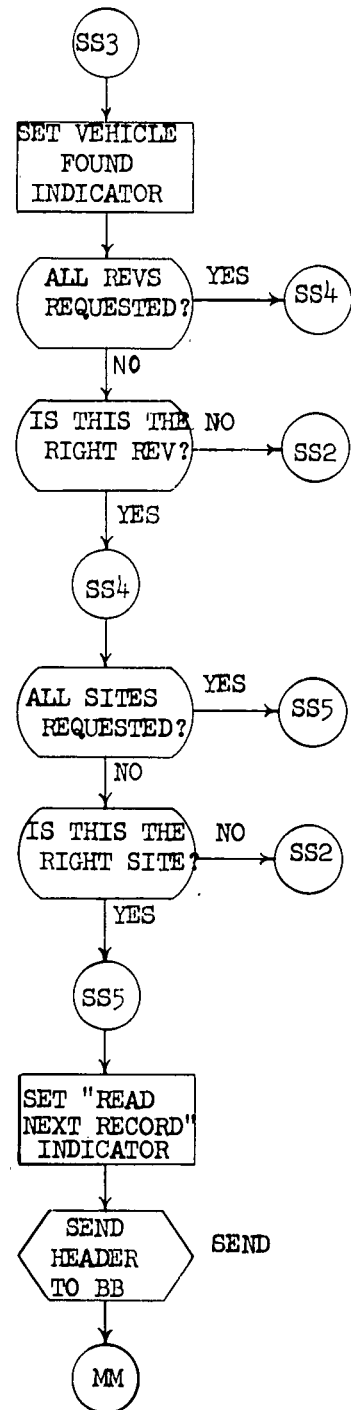
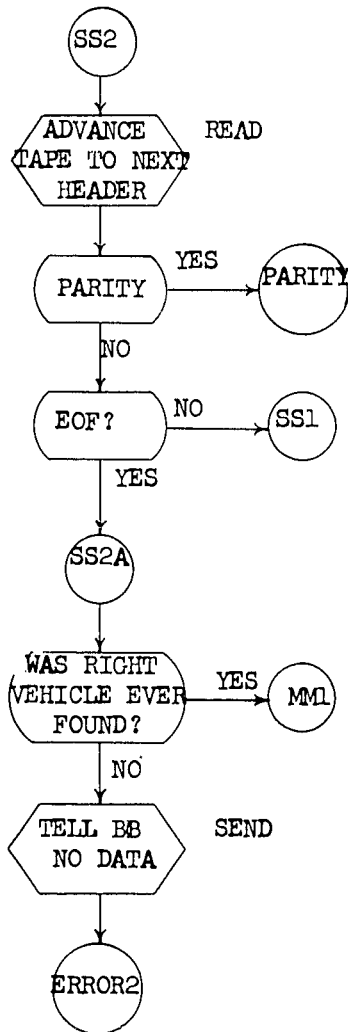
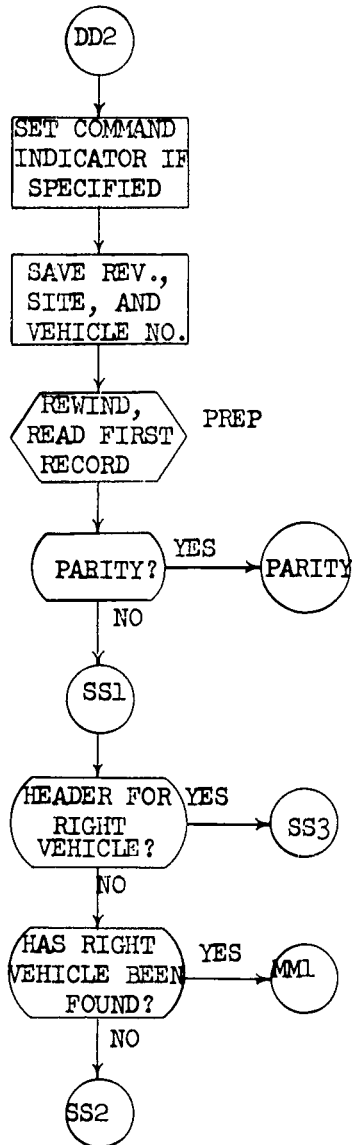
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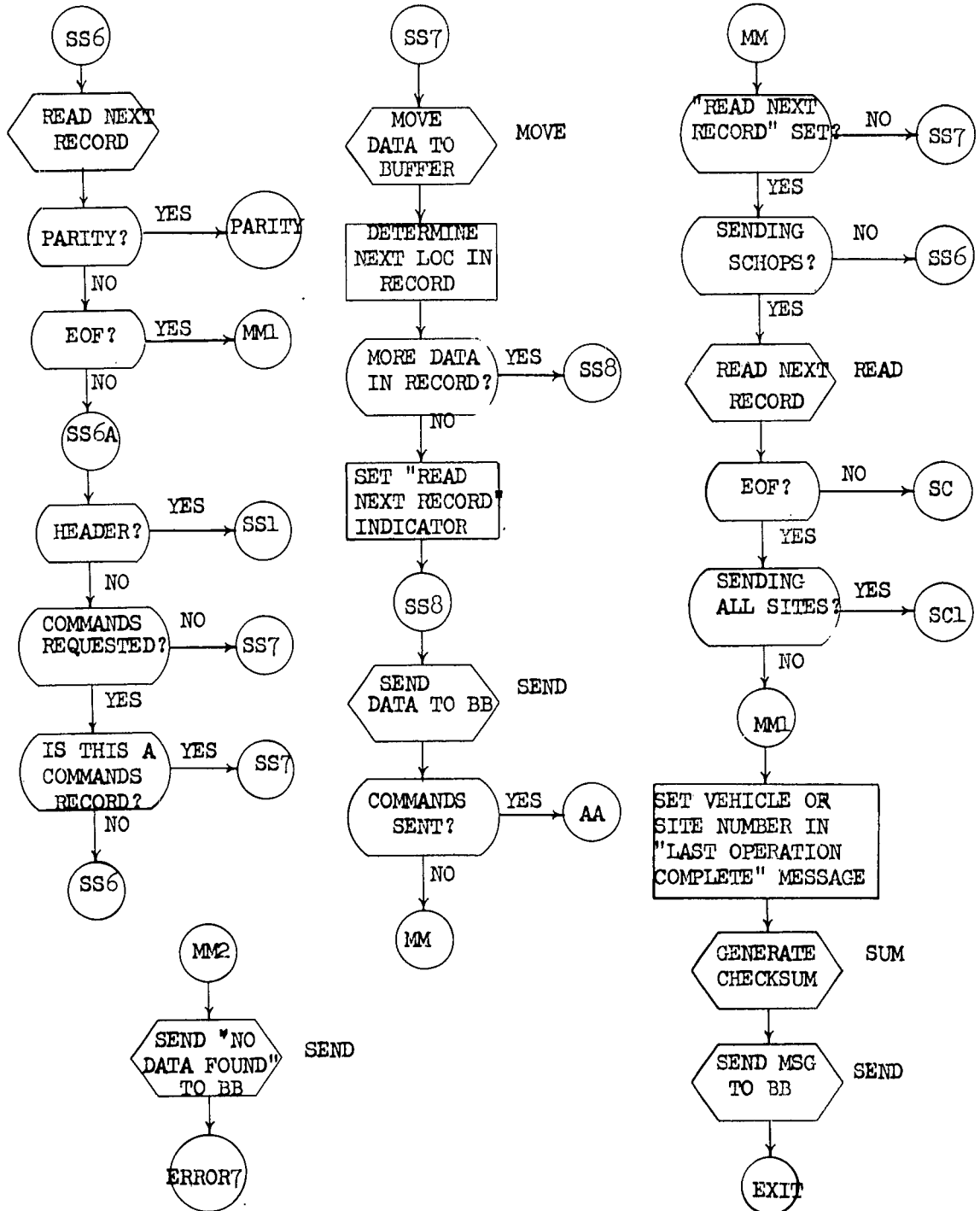


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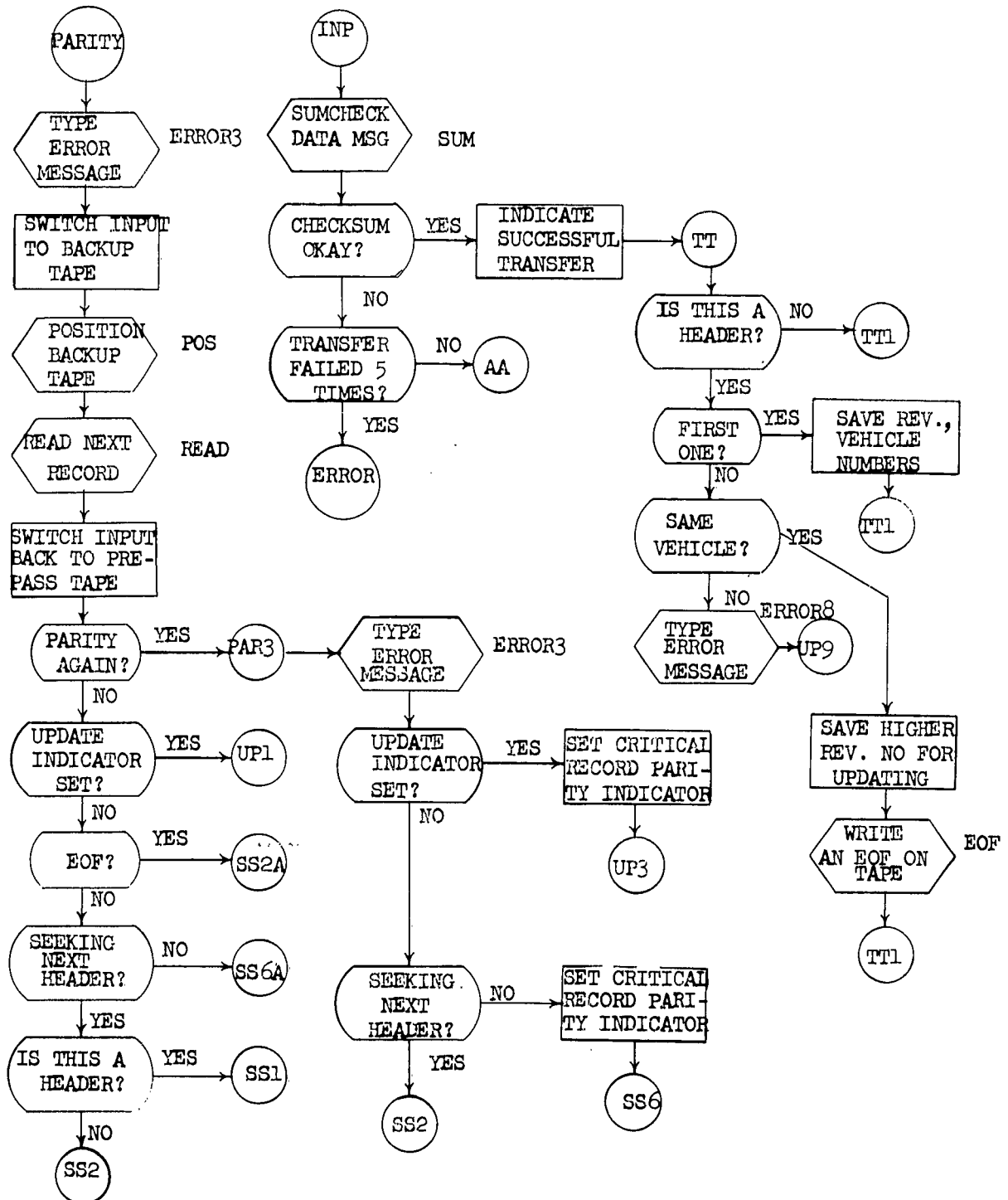
-12-

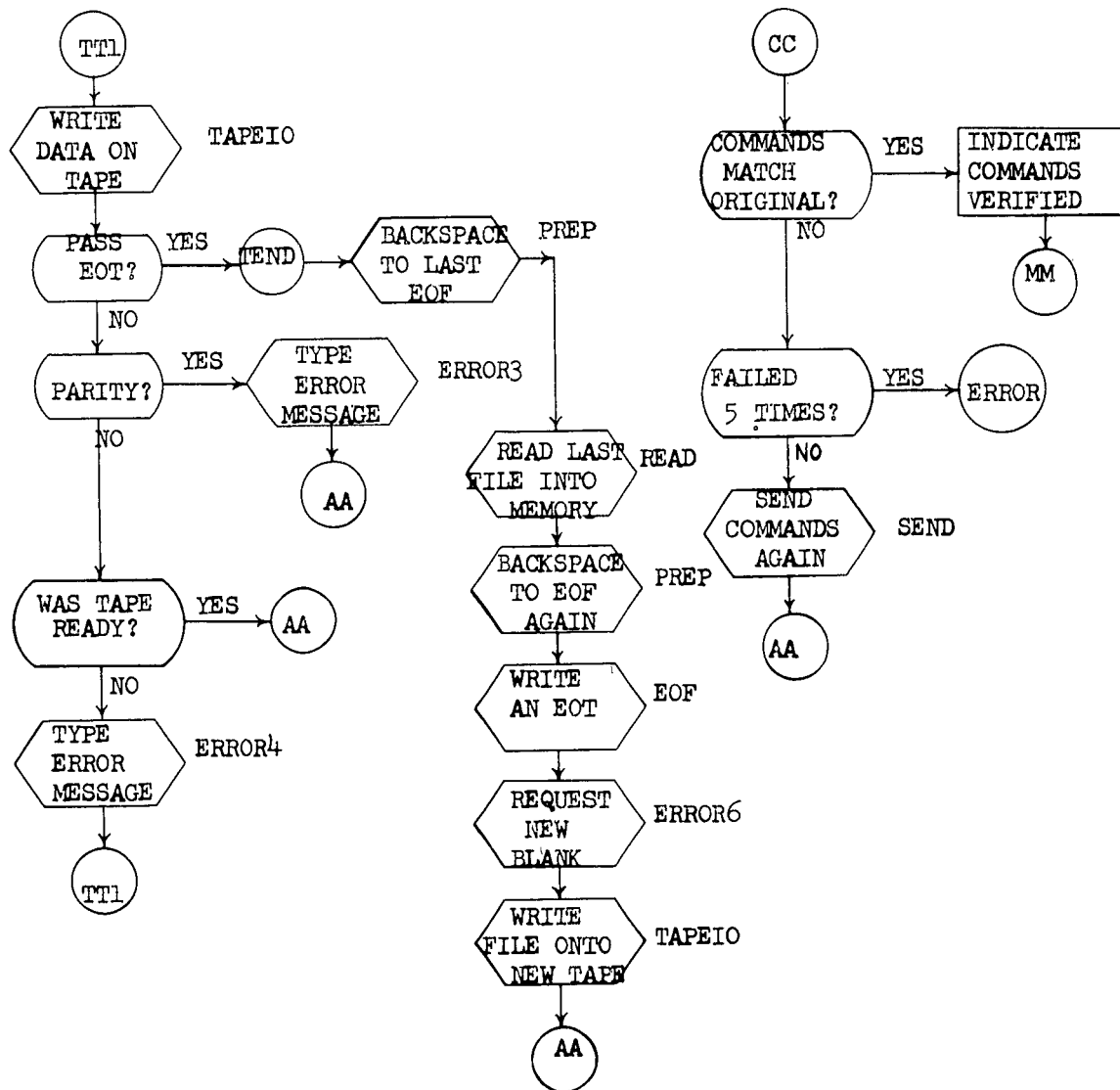
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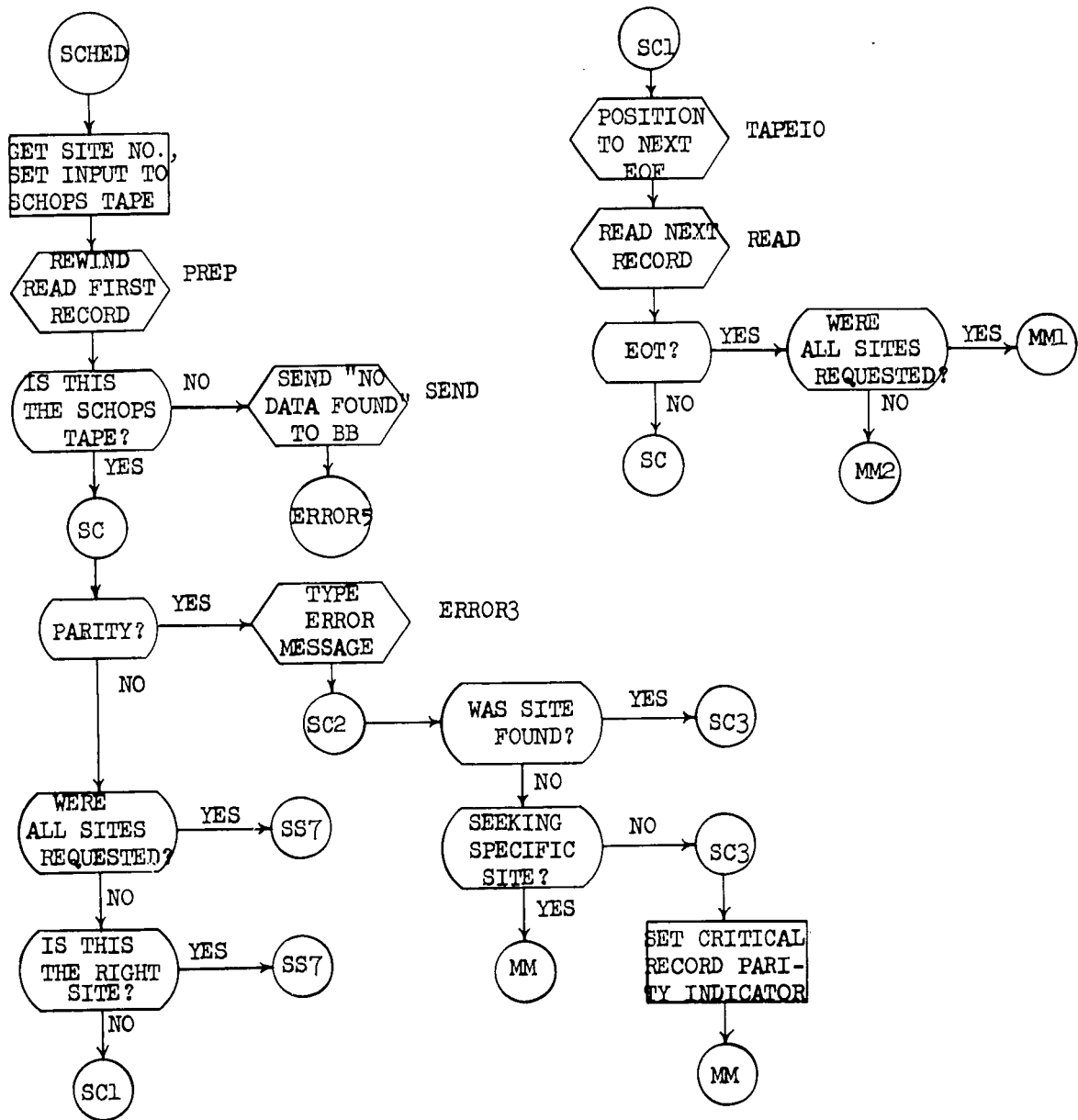


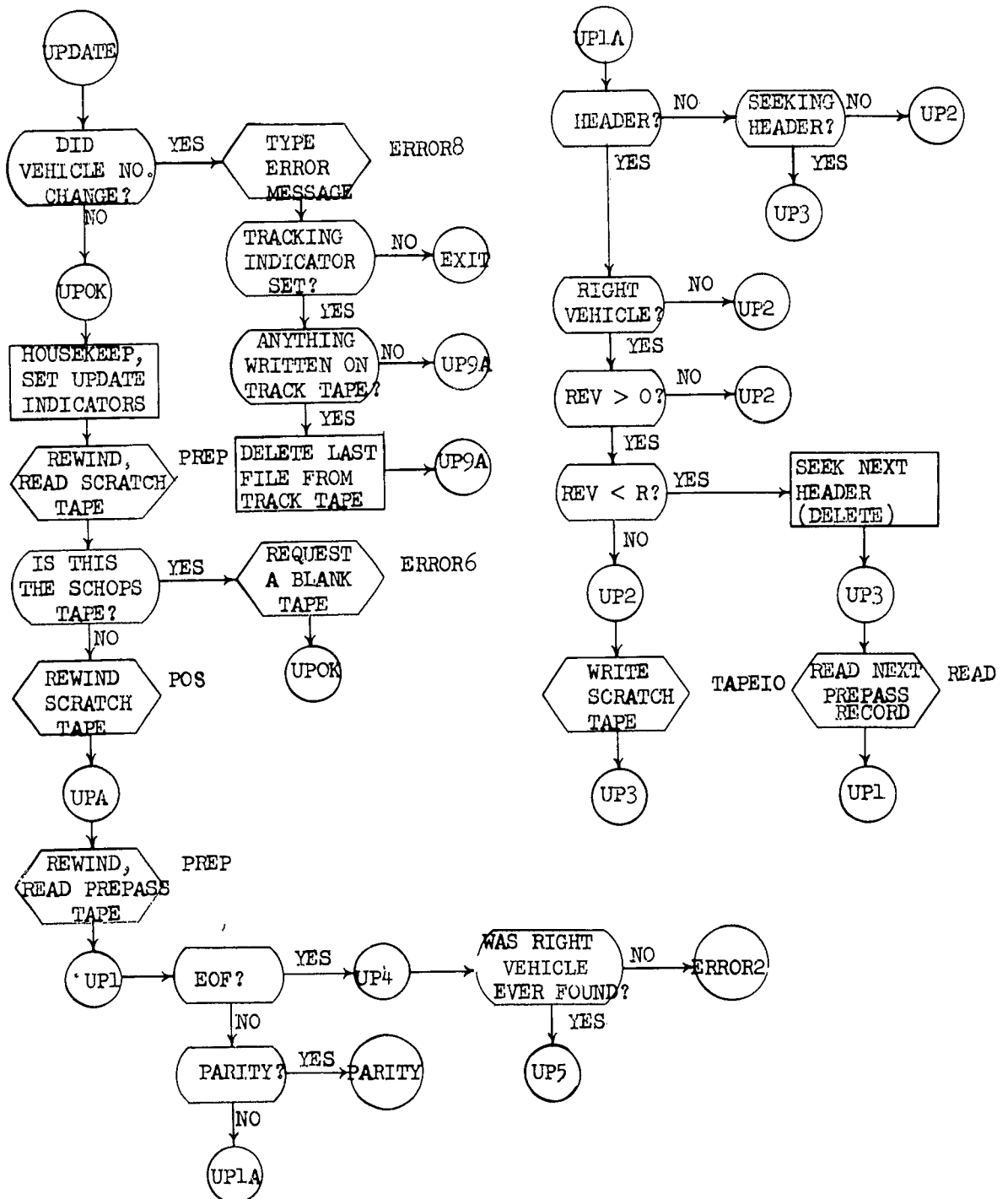


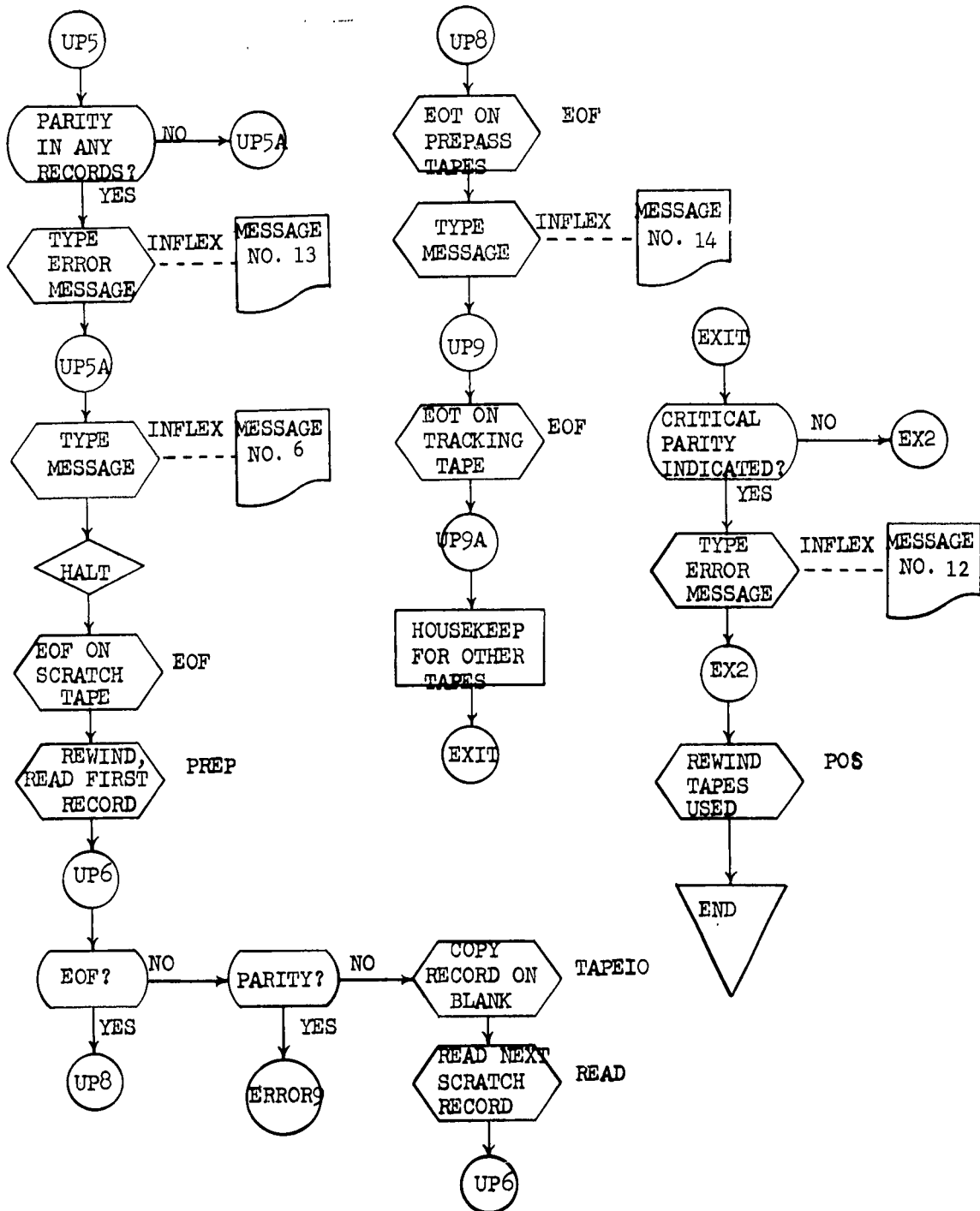
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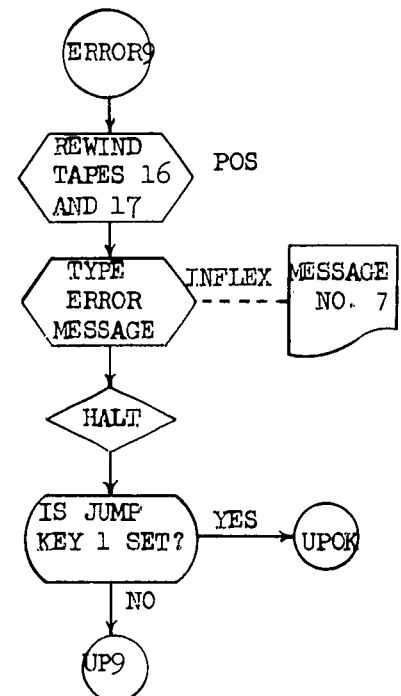
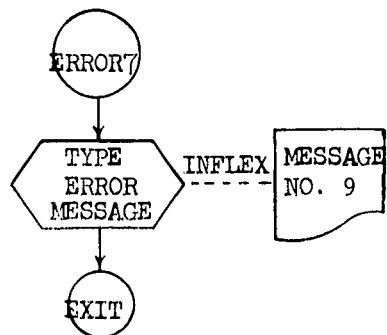
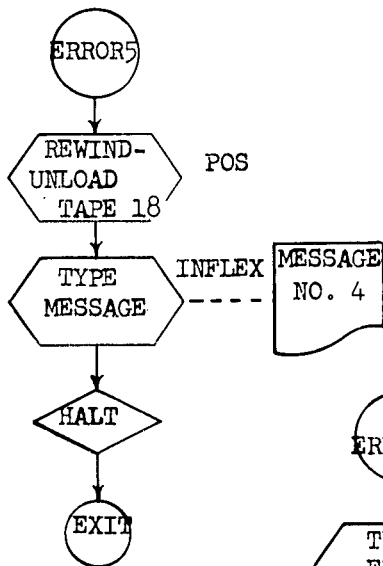
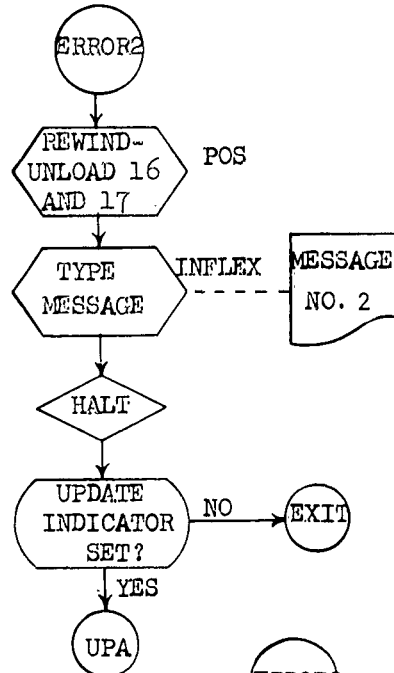
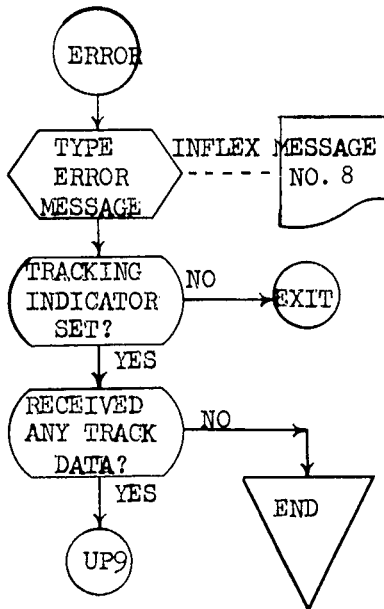




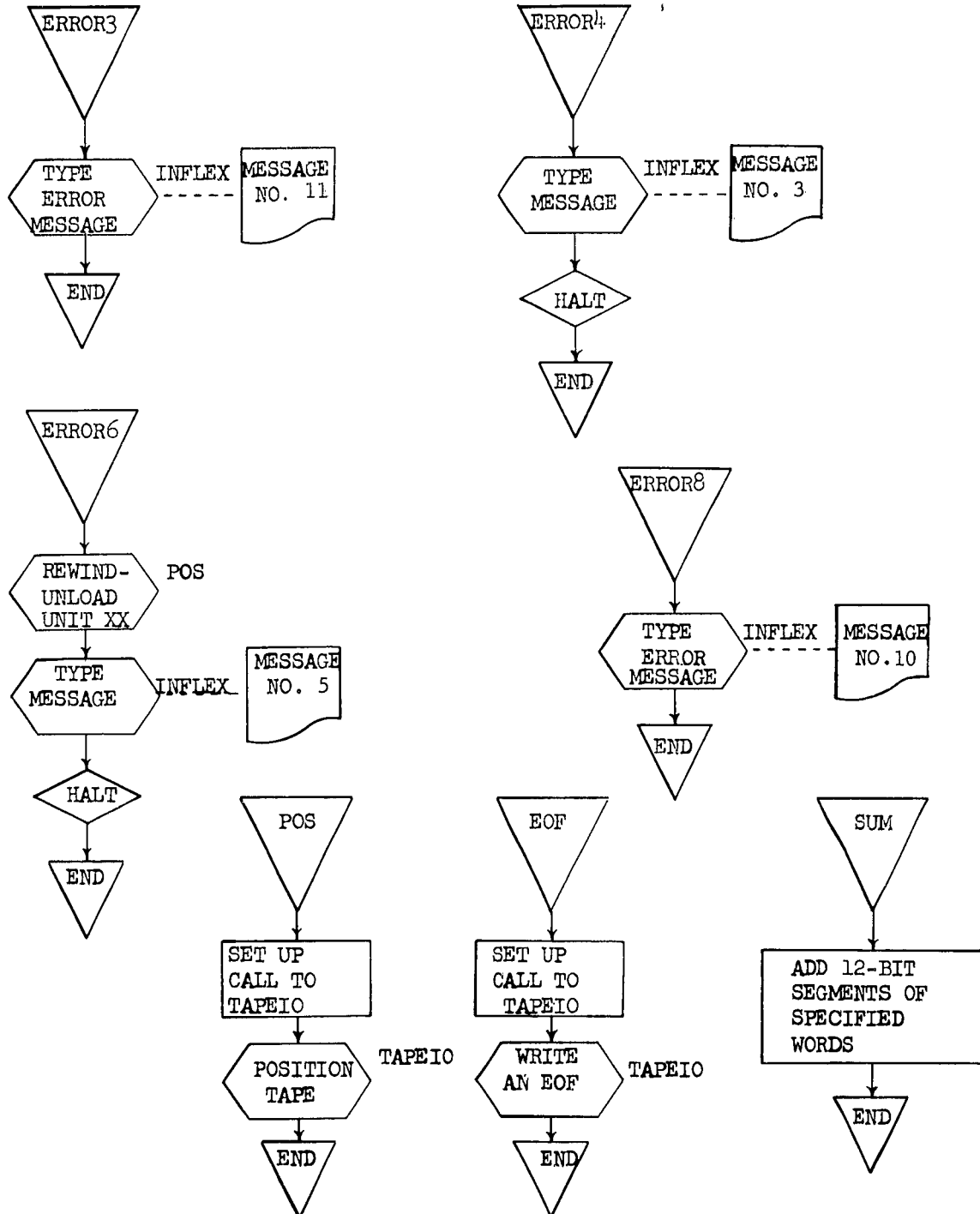


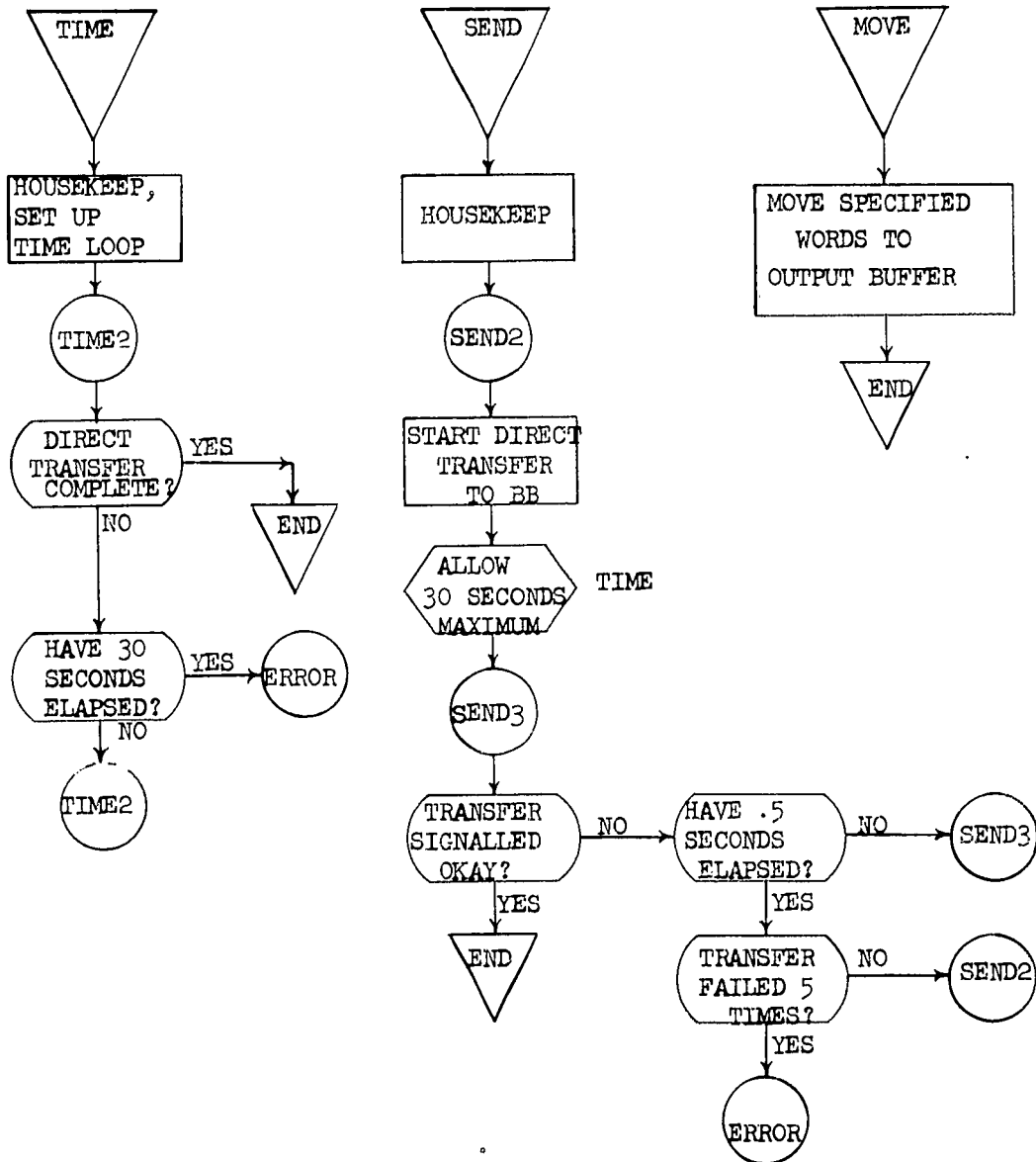


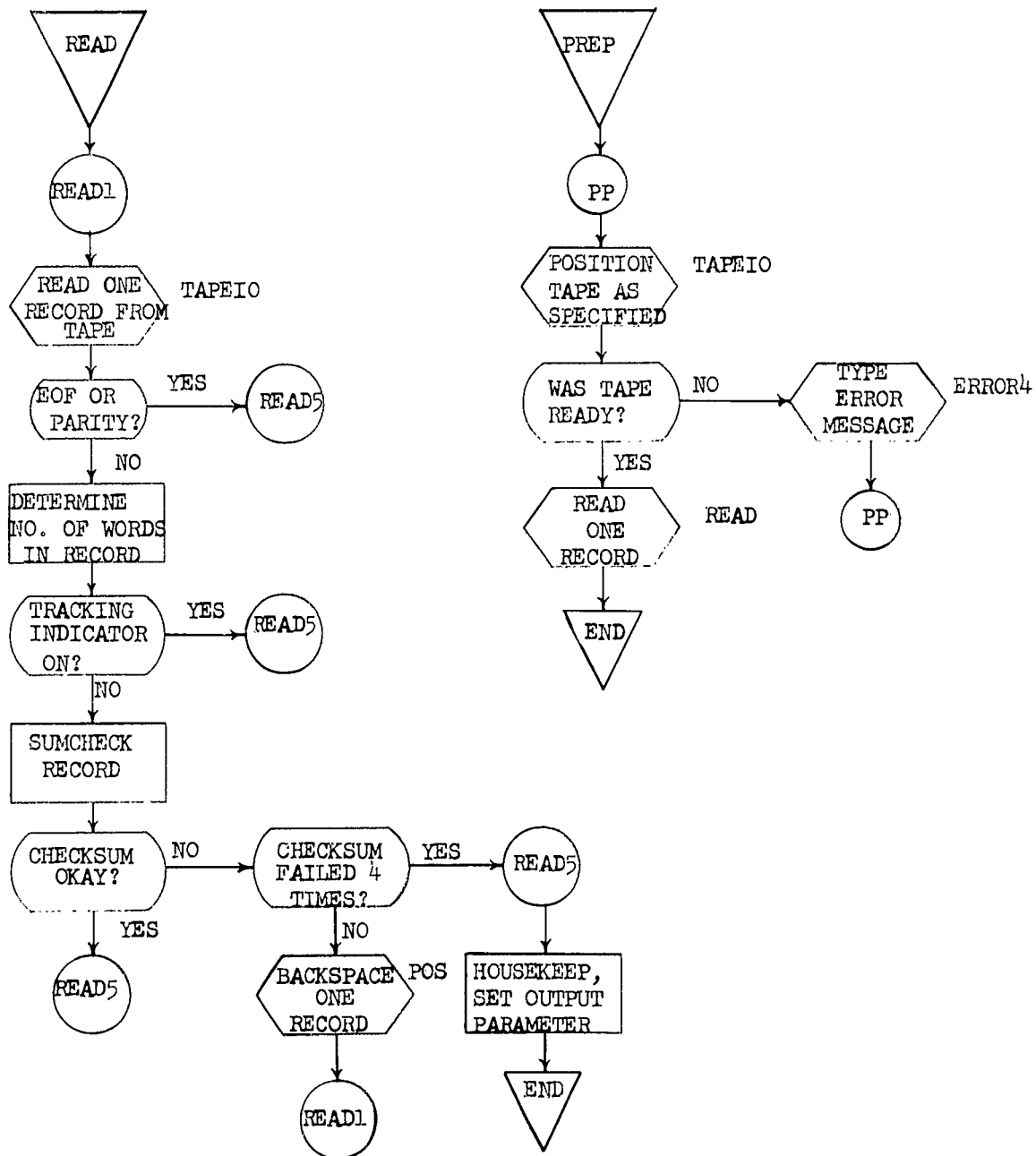




INTERNAL SUBROUTINES







APPENDIX A - CONTROL MESSAGE FORMATS

All control messages are a fixed length of eight 12-bit words.

A. "Pass Data Follows"

<u>Word</u>	<u>Octal</u>	<u>Meaning</u>
1st	7777	Header
2nd	0007	Message length
3rd	0001	Pass Data Follows
4th - 7th	XXXX	Ignored
8th	CKSM	Checksum

This message is sent by the Bird Buffer to tell the 1604 that it is about to send tracking and vehicle time data.

B. "Transfer Prepass to Bird Buffer"

<u>Word</u>	<u>Octal</u>	<u>Meaning</u>
1st	7777	Header
2nd	0007	Message length
3rd	0002	Transfer Prepass to Bird Buffer
4th	SSVV	Station ident; vehicle number
5th	VVVV	in 4-bit BCD
6th	RRRR	Rev. number in 4-bit BCD
7th	RRRR	.
8th	CKSM	Checksum

This message is sent by the Bird Buffer to request prepass data from the 1604. Station ident and/or rev number may be zero (unspecified).

C. "Send SCHOPS Data"

<u>Word</u>	<u>Octal</u>	<u>Meaning</u>
1st	7777	Header
2nd	0007	Message length
3rd	0003	Send SCHOPS Data
4th	SSXX	Station ident
5th - 7th	XXXX	Ignored
8th	CKSM	Checksum

This message is sent by the Bird Buffer to request SCHOPS data from the 1604. Station ident may be zero (unspecified).

D. "Request 1604 Commands"

<u>Word</u>	<u>Octal</u>	<u>Meaning</u>
1st	7777	Header
2nd	0007	Message length
3rd	0006	Request 1604 commands
4th	SSVV	Station ident; vehicle number in 4-bit BCD
5th	VVVV	
6th	RRRR	Rev number in 4-bit BCD
7th	RRRR	
8th	CKSM	Checksum

This message is sent by the Bird Buffer to request "real-time" commands from the 1604.

E. "Last Operation Complete"

<u>Word</u>	<u>Octal</u>	<u>Meaning</u>
1st	7777	Header
2nd	0007	Message length
3rd	1003	Last Operation Complete
4th	SSVV	Station ident; vehicle number in 4-bit BCD
5th	VVVV	
6th - 7th	XXXX	Ignored
8th	CKSM	Checksum

This message is sent by the Bird Buffer or the 1604 to indicate that all data has been transferred. If sent by the Bird Buffer (or the 1604, after transmission of prepass/command data), only the vehicle number portion of the 4th and 5th words are utilized. If sent by the 1604 after transmission of SCHOPS data, only the station ident, left-justified in the 4th word, is sent.

F. "No Data Found"

<u>Word</u>	<u>Octal</u>	<u>Meaning</u>
1st	7777	Header
2nd	0007	Message length
3rd	1004	Data requested was not found
4th - 7th	0000	Ignored
8th	CKSM	Checksum

This message is sent by the 1604 to tell the Bird Buffer that the requested prepass, command, or SCHOPS data could not be found.

APPENDIX B - DATA MESSAGE FORMATS

- A. Bird Buffer to 1604 data messages are a fixed length of 32 12-bit words; where less than 32 words are shown in the following, the remaining words are all zeros.

1. Header

<u>Word</u>	<u>Octal</u>	<u>Meaning</u>
1st	B B	BCD Identification
2nd	- 1	
3rd	6 0	
4th	4	
5th	T R	
6th	A N	
7th	S F	
8th	E R	
9th	D	
10th	A T	
11th	A VV	Vehicle number in 4-bit BCD
12th	VVVV	
13th	SSXX	Station ident
14th	XXXX	
15th	XXXX	Ignored
16th	XXXX	
17th	RRRR	Rev number in 4-bit BCD
18th	RRRR	
19th	AMPM	AM/PM indicator
20th	CKSM	Checksum

2. Tracking or Vehicle Time Data

<u>Word</u>	<u>Octal</u>	<u>Meaning</u>
1st	7777	Header
2nd	SSDD	Station ident, message type (14 = tracking, 15 = vehicle time)
.		Format depends on message type
.		
.		
nth	CKSM	

B. 1604 to Bird Buffer messages are a fixed length of 64 12-bit words; where less than 64 are shown in the following, the remaining words are all zeros.

1. Header

<u>Word</u>	<u>Octal</u>	<u>Meaning</u>
1st	1 6	BCD Identification
2nd	0 4	
3rd	- B	
4th	B	
5th	T R	
6th	A N	
7th	S F	
8th	E R	
9th	D	
10th	A T	Station ident
11th	A SS	
12th	XXXX	
13th	RRRR	

Rev number in 4-bit BCD

<u>Word</u>	<u>Octal</u>	<u>Meaning</u>
14th	RRRR	
15th	OOVV	Vehicle number in 4-bit BCD
16th	VVVV	
17th	CKSM	Checksum

2. Prepass Data (including Commands)

<u>Word</u>	<u>Octal</u>	<u>Meaning</u>
1st	7777	Header
2nd	SSDD	Station, message type
.		Format depends on message type
.		
.		
nth	CKSM	Checksum

3. SCHOPS Data

<u>Word</u>	<u>Octal</u>	<u>Meaning</u>
1st	7777	Header
2nd	SSDD	Station ident, message type (11 = text, 26 = schedules)
.		Format depends on message type
.		
.		
nth	CKSM	Checksum

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APPENDIX C - TRANSFER TAPE FORMATS

A. Bird Buffer to 1604 Transfer Tape (Tracking and Vehicle Time Data)

Header (V₁ R₁ S₁) (Vehicle, Rev, Station)
Data Message (V₁ R₁ S₁) (one message per record)
Data Message (V₁ R₁ S₁)
Data Message (V₁ R₁ S₁)

.
.
.

Data Message (V₁ R₁ S₁)

EOF

Header (V₁ R₁ S₂)
Data Message (V₁ R₁ S₂)

.
.
.

Data Message (V₁ R₁ S₂)

EOF

Header (V₁ R₂ S₁)
Data Message (V₁ R₂ S₁)

.
.
.

Data Message (V₁ R₂ S₁)

EOF

.
.
.

Header (V_X R_Y S_Z)
Data Message (V_X R_Y S_Z)

.
.
.

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Data Message $(V_X R_Y S_Z)$

EOF

EOF

B. 1604 to Bird Buffer Transfer Tape (Prepass and Command Data)

Header $(V_1 R_1 S_1)$

Data Block $(V_1 R_1 S_1)$ (n messages per record, m records per header)

Data Block $(V_1 R_1 S_1)$

.

.

.

Data Block

Header $(V_1 R_1 S_2)$

Data Block $(V_1 R_1 S_2)$

.

.

.

Header $(V_1 R_2 S_1)$

Data Block $(V_1 R_2 S_1)$

.

.

.

Header $(V_1 R_2 S_2)$

.

.

.

Header $(V_X R_Y S_Z)$

Data Block $(V_X R_Y S_Z)$

.

.

.

EOF

EOF

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C. SCHOPS Tape

Data Block (S_1) (n messages per record, m records per station)

EOF

Data Block (S_2)

EOF

Data Block (S_3)

EOF

.
.
.

Data Block (S_n)

EOF

EOF

APPENDIX D - VALIDATION

A short program was written to generate three dummy transfer tapes on the 1604 side (two prepass tapes and a SCHOPS tape); another tape containing dummy pass data was generated for the 160A side. SBRDTLK and SIBBTC were then exercised in the following order.

Test 1 Request prepass data from the 1604 for:

Vehicle 2
Rev 1
All sites

Test 2 Request real-time commands from the 1604 for:

Vehicle 1
Rev 2
Site 2

Test 3 Request SCHOPS data from the 1604 for:

Site 5

Test 4 Request prepass data from the 1604 for:

Vehicle 1
All revs
Site 1

Test 5 Send tracking data to the 1604 for:

Vehicle 1
Site 1, 2
Rev 1, 2, 3

Test 6 Send tracking data to the 1604 for:

Vehicle 2

Site 1, 2

Rev 1, 2, 3

Required 1604 Programs

1. STAN - generates dummy 1604 transfer tapes
2. MTCII - version containing 1607 satellite interrupt capability
3. SBRDTLK

Required 160A Programs

1. SSTL - reads track and vehicle time tape into 160A
2. SFCHEX - dumps data transmitted to 160A on the 166 printer
3. SIBBTC
4. Dummy program to use SIBBTC as a subroutine

Method

The dummy 160A program was used to simulate Bird Buffer control cards and SIBBTC's "users". It was written specifically to call for the tests described above. During execution, a patch to SIBBTC printed out data transmitted from the 1604 as it arrived, for visual verification. Data transmitted to the 1604 was saved on the transfer tape for later examination.

DISTRIBUTION LIST

19 March 1963

Internal

TM-(L)-715/045/00

AFCPL	(5)	KEY, C. D.	23013
ALLFREE, D.	24083	KEYES, R. A.	24073
ALPERIN, N. I.	22153	KINKEAD, R. L.	22093
ARMSTRONG, E.	24123	KNEEMEYER, J. A.	22088A
BERNARDS, R. M.	SUNNYVALE	KNIGHT, R. D.	22119
BIGGAR, D.	24118A	KOLBO, L. A.	22155
BILEK, R. W.	23007	KOSTINER, M.	14056B
BLACK, H.	14039	KRALIAN, R. P.	14039
BRENTON, L. R.	24103B	KRISTENSEN, K.	SUNNYVALE
BURKE, B. E.	24086	LACHAPELLE, F.	22093
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CHIODINI, C. M.	24091	LAVINE, J.	24093
CIACCIA, B. G.	24082A	LITTLE, J. L.	24088B
CLINE, B. J.	24127	LONG, F.	22156
COGLEY, J. L.	22156	MADRID, G. A.	22081
CONGER, L.	24088A	MAHON, G. A.	24089
COOLEY, P. R.	24081	MARIONI, J. D.	24076B
COURT, T. D.	24086B	MARTIN, W. P.	24127B
CRUM, D. W.	24105	MCKEOWN, J.	23013
DANT, G. B.	24086B	MICHAELSON, S. A.	14039
DECUIR, L. E.	24053A	MILANESE, J. J.	22155
DERANGO, W. C.	24082B	MUNSON, J. B.	22087A
DEXTER, G. W.	25016	MYERS, G. L.	14056A
DISSE, R. J.	23014	NELSON, P. A.	24075
DOBBS, G. H.	22116B	NG, J.	22077
DOBRUSKY, W. B.	24065A	NGOU, L.	24127
ELLIS, R. C.	22131A	PADGETT, L. A.	24110A
EMIGH, G. A.	14039	PATIN, O. E.	SUNNYVALE
ERICKSEN, S. R.	22113	POLK, T. W.	24113
FELKINS, J.	24097	PRUETT, B. R.	22084
FOSTER, G. A.	14039	RAYBIN, M.	14039
FRANKS, M. A.	24122	REILLY, D. F.	24121
FREY, C. R.	22078	REMSTAD, C. L.	25026
FRIEDEN, H. J.	22082	RUSSELL, R. S.	14054
GARDNER, S. A.	25026	SCHOLZ, J. W.	14039
GREENWALD, I. D.	22094A	SCOTT, R. J.	24110
GRIFFITH, E. L.	22081	SEACAT, C. M.	SUNNYVALE
HAAKE, J. W.	22153	SEIDEN, H. R.	22126B
HARRIS, E. D.	24081	SHAPIRO, R. S.	24110B
HENLEY, D. E.	22094B	SKELTON, R. H.	22148
HILL, C. L.	22101	SOLOMON, J.	22076
HILLHOUSE, J.	22078	SPEER, N. J.	24086A
HOLMES, M. A.	24103	STONE, E. S.	24058B
HOLZMAN, H. J.	24065B	SWEENEY, M. J.	25026
HOUGHTON, W. H.	24103B	TABER, W. E.	22101
HOYT, R. L.	14039	TENNANT, T. C.	27029
IMEL, L. E.	14039	TESTERMAN, W. D.	14039
KASTAMA, P. T.	22076	THOMPSON, J. W.	24088
KAYSER, F. M.	24109	THORNTON, R. L.	14050
KEDDY, J. R.	24105	TOTSCHEK, R. A.	24120

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VORHAUS, A. H.
WAGNER, I. T.
WARSHAWSKY, S. B.
WEST, G. D.
WEST, G. P.
WILSON, G. D.

24076A
24093
24097
SUNNYVALE
22116A
24124

WINSOR, M. E.
WINTER, J. E.
WISE, R. C.
WONG, J. P.
ZUBRIS, C. J.

22156
24117
22085
SUNNYVALE
24075

UNCLASSIFIED

System Development Corporation,
Santa Monica, California
UTILITY PROGRAM DESCRIPTIONS
MILESTONE 11 - 1604 TO BIRD BUFFER
COMMUNICATION (SBRDTLK).
Scientific rept., TM(L)-715/045/00,
by S. A. Gardner, 19 March 1963, 33p.
(Contract AF 19(628)-1648, Space Systems
Division Program, for Space Systems
Division, AFSC)

Unclassified report

DESCRIPTORS: Satellite Network.
Programming (Computers).

States that the 1604 to Bird Buffer
Communication (SBRDTLK) program

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provides the communication link
between the 1604 and Bird Buffer
(160A) computers via a tape
control unit operating in the
satellite mode.

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